

# PhD Handbook

## Robotics Engineering Program

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This document is a supplement to the information contained in the [Graduate Catalog](#). Together, this document and the Graduate Catalog specify the regulations of the Robotics Engineering (RBE) Doctoral Program. It is the student's responsibility to become familiar with and follow the specified regulations.

Each student is assigned an academic advisor when enrolled into the RBE doctoral program. Any questions regarding the regulations of the Robotics Engineering Doctoral Program should be discussed with the academic advisor. Students have the option of changing their academic advisor with the agreement of the new advisor and coordination with the Graduate Administrative Assistant. In most cases, the academic and research advisor are the same.

### Doctoral Credit Requirements

The Robotics Engineering doctoral program requires 60 credit hours of work beyond an M.S. degree or 90 credit hours beyond a B.S. degree. Coursework must include 3 credit hours of Management or Systems Engineering courses at the 500 level or above. This requirement may be satisfied as part of the M.S. in Robotics Engineering or other M.S. program. All entering students must submit a [Plan of Study](#) identifying the courses to be taken and a prospective research area before completing more than 9 graduate credits. The Plan of Study must be approved by the student's academic advisor and submitted to the RBE Graduate Program Committee, and must include the following minimum requirements.

For students entering with an M.S., the 60 credits shall be distributed as follows:

1. Graduate coursework, including Special Topics and Independent Study (12 credits). If not already included in the M.S. degree, the credits must include:
  - a. 3 credit hours of Management courses at the 500 level or above, or
  - b. 3 credit hours of Systems Engineering courses at the 500 level or above.
2. RBE 699 Dissertation Research (30 credits).
3. Other. Additional graduate coursework, Independent Study, RBE598 Directed Research or RBE 699 Dissertation Research (18 credits).

For students entering with a B.S., the 90 credits shall be distributed as follows:

1. RBE M.S. Degree Requirements (30 credits).
2. Graduate coursework, including Special Topics and Independent Study (12 credits).
3. RBE 699 Dissertation Research (30 credits).
4. Other. Additional graduate coursework, Independent Study, RBE 598 Directed Research or RBE 699 Dissertation Research (18 credits).

## Summary of Credit Requirements

	Enter with M.S.	Enter with B.S.
M.S. Degree Requirements	--	30
Coursework	12	12
Additional courses/research	18	18
Dissertation	30	30
<b>Total</b>	<b>60</b>	<b>90</b>

## Doctoral Qualifiers

The Doctoral Qualifiers evaluates each student's level of academic preparation. The Doctoral Qualifiers consist of four topic qualifiers: Technical, Writing, Speaking and Research.

### Technical Qualifier

The technical qualifier ensures sufficient background in the core areas of robotics engineering. Student may demonstrate proficiency in robotics engineering by completing the foundational courses, or equivalent – *RBE 500 Foundations of Robotics*, *RBE/ME 501 Robot Dynamics* and *RBE 502 Robot Control*. Technical qualification in one or more of these areas can also be achieved by taking the final written exam for a given course, which is then evaluate with a letter grade. Passing the technical qualifier is achieved with a grade distribution of two A's and a B, or better. The student will need to fill in the [Technical Qualifier Evaluation Form](#) and submit the completed form to the Graduate Administrative Assistant.

### Writing Qualifier

The writing qualifier evaluates written communication skills. The student must write a 6-8 page scholarly document as the sole or primary author (if co-authored). The quality of the scholarly document must be worthy of external, peer review. The RBE Graduate Program Committee (GPC) will select two or more faculty members, at least one of which must be affiliated with the RBE program, to evaluate the scholarly document. Co-authors must be approved by the evaluators and must not be one of the evaluators. Also, the student's advisor cannot be an evaluator.

The evaluation of the Writing Qualifier will be based on the:

- technical correctness of the document referencing the pertinent and recent publications,
- organization of the document,
- clarity of the writing, and
- ability to convey the completed work to a reader with basic knowledge of the area.

Evaluators will use the [Writing Qualifier Review Form](#) to evaluate the student's writing and provide feedback. The completed form should be submitted to the Graduate Administrative Assistant.

### Speaking Qualifier

The speaking qualifier evaluates verbal communication skills. The student shall give a public technical talk at WPI, accessible to a general audience, on a topic that is directly related to robotic engineering. The RBE Graduate Program Committee will select two or more faculty members, at least one of which must be affiliated with the RBE program, to evaluate the public technical talk. The student's advisor cannot be an evaluator. The talk must be scheduled such that

all evaluators are able to attend. Information regarding the topic, such as the title and abstract should be provided to the Graduate Administrative Assistant to advanced advertising to the WPI community. Students can provide this information by going to the Schedule a RBE Presentation form.

The evaluation of the Speaking Qualifier is based on the effectiveness of the student to verbally explain the topic at hand. Evaluator will use the [Speaking Qualifier Review Form](#) to evaluate the student's speaking skills and provide feedback. The student should submit the completed form to the Graduate Administrative Assistant.

WPI provided multiple opportunities for students to practice their speaking skills. In addition to individual research group meetings, research area seminars also provide venues for public speaking (e.g. HRI, AIRG, ISRG, etc.). It is recommended that students make their presentation as part of a regular meeting of one of these groups, though scheduling a special time and date is also acceptable.

### Research Qualifier

The research qualifier evaluates the ability to conduct research. The student must register for one semester comprising of at least 3 credits of Directed Research (RBE 598) with an RBE affiliated faculty acting as the Research Advisor. At the end of the semester, the Research Advisor will evaluate the research work, independent of the final grade assigned for the directed research credit. Reattempts may be taken with a different Research Advisor.

The student's research advisor will need to complete the [Research Qualifier Evaluation Form](#). The student should submit the completed form to the Graduate Administrative Assistant.

The above qualifiers are designed to ensure that students not only have sufficient knowledge of their field, but also the abilities to perform research and communicate technical ideas with clarity. It is expected that multiple qualifiers can be completed with a single project. For example, a student may perform a research quality with a faculty member and use the outcome of that research to complete the speaking and writing qualifiers.

Doctoral students must successfully complete the Doctoral Qualifiers by the end of their 4<sup>th</sup> semester. If the candidate fails, the second attempt should be by the end of the 5<sup>th</sup> semester. Students should form their dissertation committees by the end of their 7<sup>th</sup> semester. The first dissertation proposal should be submitted and presented by the end of the 8<sup>th</sup> semester. The dissertation committee will decide on the date for the dissertation defense.

### Summary of Doctoral Qualifier Deadlines

Year 1	Semester 1	Plan of study
	Semester 2	
Year 2	Semester 1	
	Semester 2	Qualifiers completed
Year 3	Semester 1	Qualifiers 2 <sup>nd</sup> attempt (if needed)
	Semester 2	
Year 4	Semester 1	Form dissertation committee
	Semester 2	First dissertation proposal

Year 5	Semester 1	Dissertation defense (to be determined by committee)
	Semester 2	

### Expected PhD Program Progress



Upon successful completion of the Doctoral Qualifiers, the doctoral student advances to PhD candidacy. Upon failing any topic qualifier, the student may retake the failed topic qualifier one additional time. The second attempt should be by the end of the 5<sup>th</sup> semester. Failing any topic qualifier twice results in the dismissal from the Robotics Engineering doctoral program. However, students can petition the RBE Graduate Program Committee to review their case. After reviewing the case, the committee can decide to let the student take the qualifier one additional time.

### RBE Colloquia

The Robotics Engineering Program hosts colloquia every Friday afternoon during the academic school year. Graduate students must attend 50% of the colloquia. The [RBE's colloquia](#) are a professional development opportunity to broaden knowledge as well as network with other industry and university colleagues. Students will be required to submit a report summarizing at least 6 seminars per year (in total 3 pages), along with their annual evaluation (see below).

### Annual Evaluation

Students will submit a self-evaluation form each year. Advisors will submit a separate form. The [annual evaluation](#) is based on a student's performance in the following 3 categories over a given academic year.

1. Research – Thesis topic, future publications, ability to conduct quality research, ability to think of and discuss new ideas and overall progress
2. Professionalism – Conduct, presentation skills, writing skills, communication skills and teamwork
3. Educational progress – Academic progress, career development and future goals and teaching opportunities.

The student's research advisor will identify whether the student's performance in these categories either *exceeded expectations*, *met expectation*, *are a concern* or *unsatisfactory*. Based on this assessment, the RBE faculty will then determine the student's overall performance for the given academic year.

Students will receive a letter from the GPC on behalf of the RBE program about their overall performance. The letter may identify accomplishments and recommendations for improvement. Students that earn a *concerned* will meet with their advisor to develop a research plan for the next 6 months. The student will be re-evaluated in December and if the result continues to be *unsatisfactory*, the removal of the student will be considered at the next RBE program meeting.

## Internship Policy

The following information is adapted from the WPI Graduate Catalogue, with RBE specific additions, as well as the [Office of Graduate Studies](#).

### Overview

Graduate internship experiences are available across several programs of study at WPI in order to enhance the professional development of Masters and Doctoral students. The graduate internship is a short-term and temporary work assignment in residence at a company or other external organization that forms a complementary part of a student's education program. While not a required part of the graduate experience, an internship is a valuable addition to a student's education and future resume.

### Requirement and Exclusions

To enroll for a graduate internship experience, Robotics Engineering students must have successfully completed at least their first 12 credits of graduate coursework at WPI, be in good academic standing, and have approval from both their advisor and the [Office of Graduate studies](#) (OGS), via the use of OGS's registration form.

*Prior* to securing an internship, and *before* the semester you intend to use, you must speak with your faculty academic advisor to determine whether an internship is appropriate. Upon their approval, you can then attempt to secure an internship. If you secure an internship, you must meet again with your faculty academic advisor to determine the evaluation criteria for your internship. This may include defining concrete performance metrics and objectives to be achieved during the internship prior to the experience.

If an internship employer requires you to complete a Non-Disclosure Agreement (NDA), you should review the NDA with your advisor to ensure that you will be able to complete the NDA and still be able to have your internship experience evaluated for a grade.

The graduate internship experience must align with the student's plan of study and be related specifically to RBE. A complete signed plan of study will be required by the OGS on their e-form.

Graduate students already employed full-time or part-time may not participate as interns at the same place of employment without the GPC approval.

Since the internship must be performed at an external site, WPI would not be considered an acceptable sponsor for a graduate internships.

Typically, Teaching Assistants may not be on internship during the same time period during the academic year as when they are serving as a TA (but may pursue an internship over the summer or with departmental/program permission).

Graduate Internships may not be applied to multiple degrees (i.e. BS/MS).

## Enrollment and Credits

Beginning in Spring 2019, a Robotics Engineering student's internship will appear on the transcript with a *minimum of 0 credits and maximum of 1 credit per semester*. Students may pursue graduate internship experiences of up to 3 credits per degree (as determined by the department/program – again, Robotics Engineering limits credits to 1 per semester, up to a maximum of 3 total).

Enrollment in the graduate internship experience must adhere to [established add/drop deadlines](#). The Office of Graduate Studies has more information and their own requirements with regard to enrolling – visit either their internship page, or go directly to their registration e-form to review.

1. **Master's Students** – With approval of their faculty academic advisor, Master's students participating in the graduate internship should register for the course Graduate Internship 5900.
2. **PhD Students** -- With approval of their faculty academic advisor, PhD students participating in the graduate internship should register for the course Graduate Internship 6900.

## Special Notes for International Students

An international graduate student on an F-1 visa must maintain full-time status for the duration of their graduate program. International students with F-1 visa status may apply for two types of practical training:

1. Curricular Practical Training (CPT) – CPT is used for graduate level internships while students are pursuing their degrees. CPT is authorized by the university and the requirement is that the internship is an integral part of an established curriculum. Internships should be for credit.
2. Optional practical Training (OPT) – OPT is typically used by students for one year of employment after completion of degree. It can also be used in part for summer jobs or part-time employment during the academic year if employment is in the student's field of study. OPT requires approval by U.S. Customs and Immigration Services.

You must secure your I-20/DS-2019 with CPT work authorization/Academic Training from the International House prior to starting your internship. Please remember that working without authorization is a violation of your F-1 or J-1 student status and could lead to termination of your SEVIS record. The International House will receive your internship registration information once you have been registered for credit, and will email you when your immigration document is ready for pick up. Allow 3 business days after course registration for the processing of your I-20/DS-2019.